

STUDIES IN HUMAN ECOLOGY

FACTORS RELEVANT TO THE OCCURRENCE OF BODILY ILLNESS AND DISTURBANCES IN MOOD, THOUGHT AND BEHAVIOR IN THREE HOMOGENEOUS POPULATION GROUPS¹

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This is an initial summary of the findings from 3 studies which have been carried out during the past 5 years. Two have been completed; the third is still in progress. Twenty-four investigators from the fields of internal medicine, psychiatry, psychology, sociology, cultural anthropology, and medical statistics have taken part in these investigations with the technical assistance of 8 others. The 3 population groups which have been studied provided a total of 2924 individuals upon which the general conclusions are based.

These studies were designed to investigate the influence which man's relation to his social environment has upon his health. They are based upon the premise that in a group of people unselected with regard to health, and essentially equal with regard to the various factors known to affect health, each individual's relation to his own life situation is an outstanding variable. In such a group, a study of the relationship between this variable and the state of health of the individual members is facilitated. It is not possible, of course, to obtain any group of human beings which is literally homogeneous with regard to all of the various factors which may affect the health of its members. One can, however, find groups which closely approach homogeneity with regard to the major factors, and in which the minor and unrecognized factors are presumably scattered at random, thus minimizing the influence of these variables as compared to the variable under study.

Among the major factors that are known to have an effect upon the health of humans are age, sex, genetic inheritance, constitution, the effects of previous disease processes, cultural background, socio-economic status (with all that this implies in terms of diet, housing, etc.), occupation, the general physical environment, and the opportunities for encountering the external causative agents relevant to disease. We have studied 3 groups, each quite different from the other 2, and each remarkably homogeneous with regard to most of these factors. The genetic inheritance and constitution of individual members, of course, cannot be controlled; but the effect of this and other variables can be assessed to some extent by a consideration of the individual case material, as will be described later.

The characteristics of these 3 groups are outlined in Table I. There were independent and complete records of all the periods of disability, and of the nature of all illnesses, which had occurred in the adult lives of the members of the two American groups, both of which were employed by a corporation that kept meticulous records of its employees' health and attendance. In the Chinese group we were forced to rely upon the medical histories given by the informants, their descriptions of the symptomatic manifestations of their illnesses, and the results of physical examinations and diagnostic tests, in order to obtain our information about their health. Information obtained in this manner from the American informants, when compared with that obtained independently from their records, was found to be reliable, and it is our belief that we have a reliable estimate of the health of our Chinese informants.

In the 2 American groups the following

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TABLE 1

CHARACTERISTICS OF THE THREE GROUPS

	Group I	Group II	Group III
1. Total number studied.....	1297	1527	100
2. Number studied intensively.....	336	279	100
3. Age	17-50	17-55	19-72
4. Sex	Women	Men	Men and women
5. Cultural background	2nd Generation Irish and Italian American	Mixed indigenous American	Chinese
6. Socio-economic background.....	Upper-lower class	Lower-middle class	Upper class
7. Education	Grammar school	High school	College
8. Occupation	Unskilled white-collar	Skilled workmen	Graduate students professional men
9. Lifetime environment	Metropolitan New York	Metropolitan New York	Various parts of China (Later United States)
10. Sanitation of general surroundings	Generally high	Generally high	Generally very low
11. Exposure to pathogens and trauma	Low	Moderate	High
12. Physical deprivations, pressures and dislocations	Few	Few	Many
13. Social dislocations and situations of uncertainty	Few	Few	Many

investigative procedure was used: the initial group was made up of all people employed in the same type of work in a division of a corporation in a large city—approximately 1,800 men in one case and approximately 1,700 women in the other. From these initial groups there were excluded all those for whom complete records were not available, leaving 1,527 men and 1,297 women. These larger groups were used for statistical studies of the distribution sickness disability and the occurrence of various illnesses among their members, over a number of years.

There were many women and men who had been observed continuously for 20 years or more. All of these women (336) and one-third of the men (279) were studied intensively, using statistical methods. When the distribution of illness over a 20-year period in these 2 smaller groups had been obtained, the 20 in each group who had been disabled for the greatest number of days, and the 20 disabled for the smallest number of days, were identified. The records of these 40, and those of many others selected at random from the middle range of each group, were examined carefully to ascertain the nature of the illness episodes which had been experienced. The informants, themselves, were interviewed by an investigator who obtained from them a complete medical history, and carried out a physical and psychiatric ex-

amination, as well as additional diagnostic procedures if any were necessary in order to complete his understanding of the case. At the same time, a life history was obtained covering the pertinent aspects of the early development and later life experiences of the informant.

A somewhat different procedure was used with the Chinese. All members of this group of 100, selected at random from a larger group of approximately 5,000 Chinese graduate students and professional men, were studied intensively for a total of 16 hours. Four hours of this were spent with an internist, 4 hours with a psychiatrist, 4 hours with a cultural anthropologist and sociologist, and 4 hours with a clinical psychologist, who administered a battery of tests including the Wechsler-Bellevue Intelligence Scale, Form I, the Rorschach Test, the Lowenfeld Mosaic, a Projective Questionnaire, the Sacks Sentence Completions, the Thurstone Temperament Scale, and Human Figure Drawings. The TAT was given to about 30 of the informants also.

Sickness disability was not distributed at random among the members of any of these groups. In each group there were many members who had more illness, and many who had less illness, than would be expected if chance alone were the determining factor. In the group of American men, upon whom

the statistical studies are most complete, the distribution of sickness episodes closely approximates the negative binomial distribution—a distribution which is based upon the assumption that some factor in addition to chance determines the occurrence of such episodes. In this group, approximately 10 percent of the men show a statistical “risk” of becoming ill which is at least twice as great as the average “risk” for the group, and another 10 percent show a correspondingly smaller “risk” (Fig. 1). The general effect of this skewed distribution of illness is that approximately one-fourth of the individuals experienced more than half of all the illnesses and upwards of 75 percent of the total days disability.

Our general inference from this finding is that, in all of these groups, some factor other than chance determines the occurrence of sickness in the individual members. Since this appears to be a consistent finding, we suspect that the same phenomenon occurs in the population at large.

An investigation of the nature of the illnesses experienced by the various members of each group revealed that in all 3 groups, those who had the greatest amount of sickness disability had experienced a wide variety of illnesses of various types, and various etiologies, involving a number of body systems. While one or two recurrent or chronic illnesses might predominate in the sickness pattern of an individual, it was a universal finding that those who had a great many episodes of illness, and a great many days of total disability, experienced illnesses involv-

ing a number of body systems. This is illustrated in Fig. 2, from the study of the American men, in which the number of illnesses experienced by each informant is plotted against the number of body systems involved. As the amount of illness experienced by each informant increases, the number of involved body systems increases.

There appears to be a similar relationship between bodily illnesses and disturbances of mood, thought, and behavior. Figure 3, taken from the study of the Chinese, illustrates this. Those having the greater number of bodily illnesses, regardless of their nature or etiology, in general, experience a greater number of disturbances of mood, thought, and behavior.

Between major and minor illnesses, the same type of relationship appears to hold. In each group, those experiencing the greater number of minor illnesses in general experience the greater number of major illnesses. Usually it was found that major illnesses involved the same body systems most frequently involved in minor illnesses. For example, individuals having a great many colds appear to be more likely to have an episode of pneumonia, and those having many minor disturbances of mood, thought, or behavior appear to be more likely to have major disabling illnesses in this category. But major illnesses may appear in other body systems also; the general relationship is shown in Fig. 4 which is taken from the study of the American men.

An example of the illnesses experienced by a frequently ill informant is shown in Table 2. This American working woman was selected for intensive study because she had had 1,041 days of sickness disability over a period of 35 years.

Our general inferences from the foregoing findings are that humans, when they move from a state of “health” into a state of “sickness” are likely to manifest disturbances of function and pathological processes involving a number of body systems. If illness persists long enough, it is likely to be manifested by disturbances in a majority of body systems, as well as by disturbances of mood, thought, and behavior. We infer that whatever factors are responsible for this operate upon man as a whole and influence illnesses

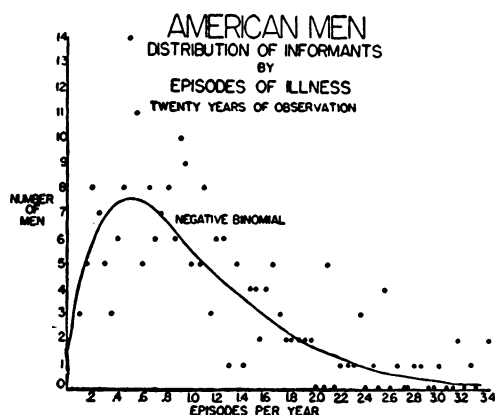
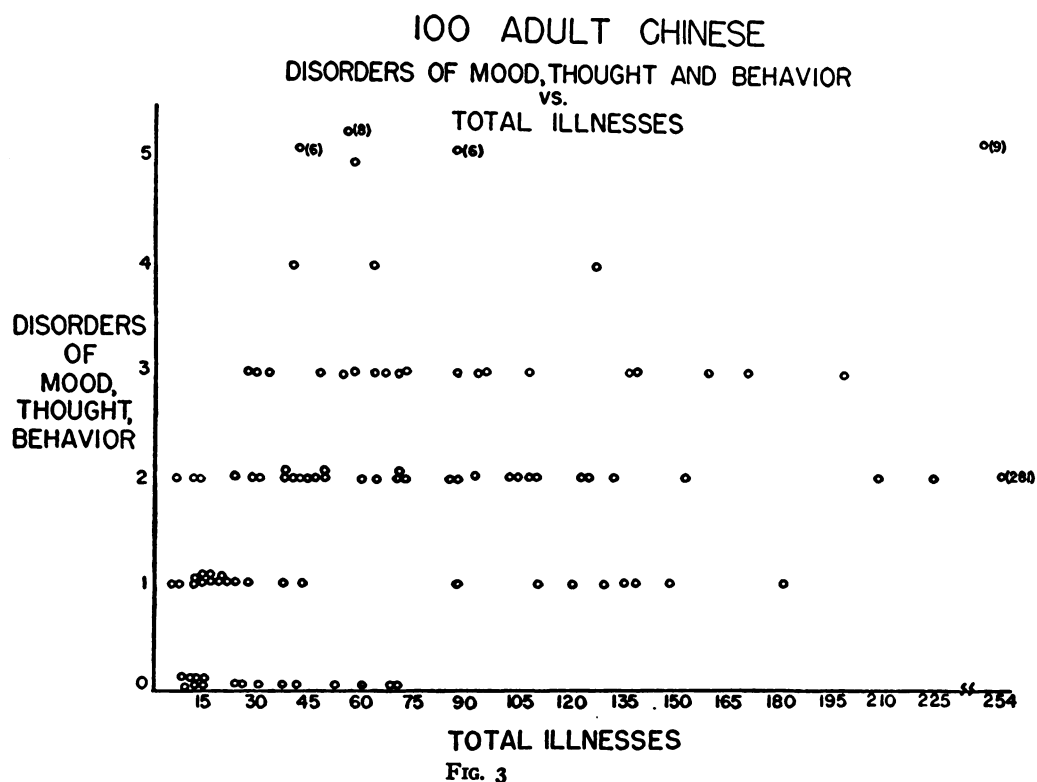
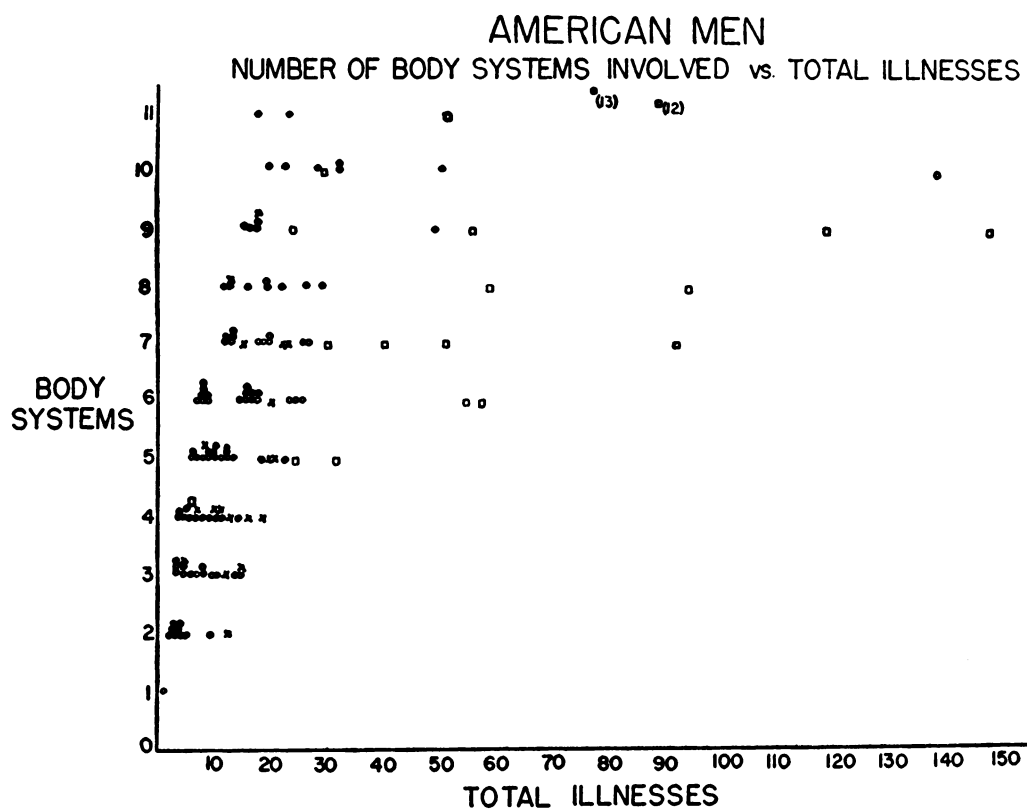


FIG. 1

TABLE 2

AN "ILL" AMERICAN WORKING WOMAN: ILLNESSES EXPERIENCED FROM AGE 16 TO AGE 51

"Body system"	Syndrome	Episodes of disability
1. Respiratory system	<i>Influenza</i>	1
	<i>Pertussis</i>	1
	Minor upper respiratory infections	(Approx.) 44
	Severe tonsillitis	2
2. Gastrointestinal system	<i>Cholecystitis and cholelithiasis</i>	2
	<i>Diaphragmatic hernia</i>	5
	Duodenal diverticulum	0
	Postoperative biliary symptoms	4
	Mucous colitis	4
	Infectious gastroenteritis	3
	(Chronic, nondisabling constipation, low abdominal pain, "gas," and nausea, present for many years)	
3. Cardiovascular system	<i>Essential hypertension</i>	0
4. Genital system	<i>Myomata of uterus</i>	1
	Dysmenorrhea (chronic)	
	Postmenopausal flushes, severe	
5. Urinary system	<i>Pyelonephritis</i>	1
	Cystitis	1
6. Blood	Hypochromic anemia	
7. Musculoskeletal system	"Low back pain"	4
	Osteoarthritis	1
8. Head	Vascular headaches	2
	(Nondisabling headaches occurred about once a month)	
9. Ears	Otitis Media	2
	Ménière's syndrome	1
10. Eyes	Conjunctivitis	1
11. Teeth	Dental caries	3
	(Total extractions)	
12. Skin	Urticaria	2
	Cellulitis	1
13. Breast	<i>Fibroma</i>	1
14. Metabolic	Obesity	
15. Mood, thought, behavior	Moderately severe depressions	3
	Anxiety-tension states	5
	(Symptoms of anxiety, tension, depression chronically present)	
Accidents	Contusions	8
	Lacerations	3
	Sprains	1
Operations	1. <i>Cholecystectomy</i>	
	2. <i>Hysterectomy and oophorectomy</i>	
	3. Excision of fibroma of breast	
	4. Total dental extractions	
Summary		
Total days disabled		1041
Disabling episodes of illness		95
"Major" illnesses		9
Disabling disturbances of mood, thought, and behavior		8
"Body systems" involved		15
Accidents		12
Operations		4



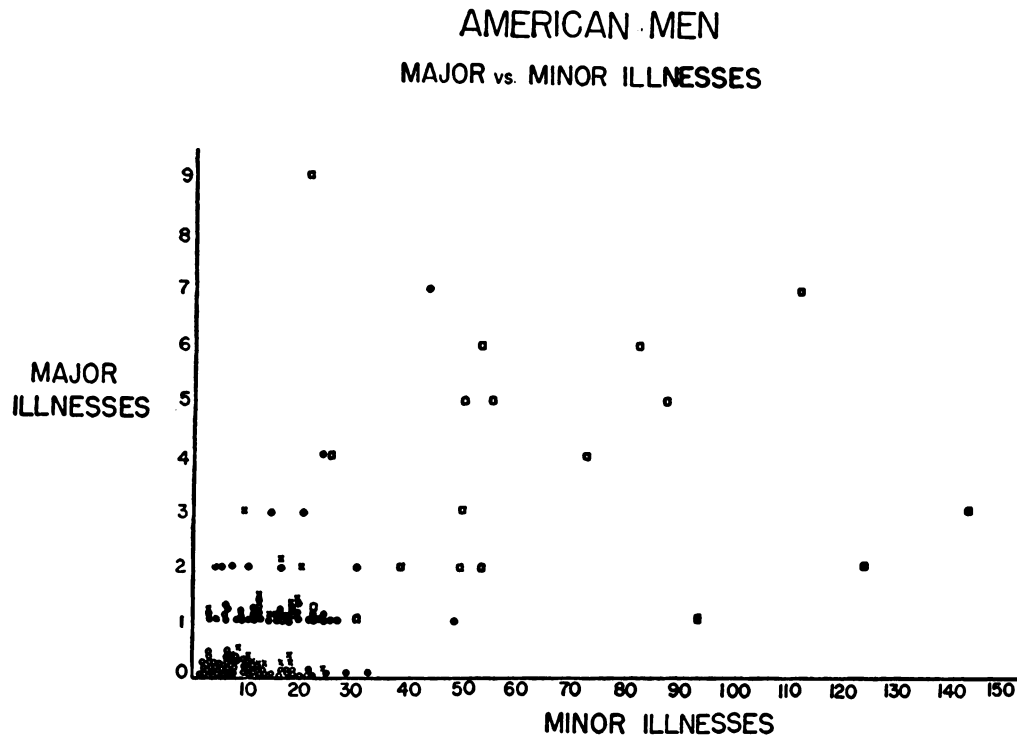


FIG. 4

regardless of their nature or etiology. They evidently influence irreversible pathological processes as well as reversible disturbances of function, and diseases which are potentially fatal as well as those which are usually transient and relatively harmless. They influence the occurrence of disturbances of mood, thought, and behavior and the occurrence of bodily illnesses in a roughly parallel manner. The relation between these two categories of illness thus appears to be one of general parallelism. As a group, those who have more of one are likely to have more of the other.

When the distribution of illness in the lives of our informants was studied, it was found that sickness episodes frequently appeared in clusters; usually they were not distributed at random throughout a lifetime. Typically, an informant would have periods of relatively good health, alternating with several years during which he would have a number of illnesses of a variety of etiologies and involving several body systems, running consecutively or concurrently. This is a common phenomenon in all 3 groups, and it ap-

pears to be uniformly distributed in each. It occurs among those who have small and intermediate amounts of illness as well as among those who have many illnesses. Some illnesses and accidents do, of course, appear as isolated phenomena; but most illnesses seem to occur in clusters. An example of this is shown in Fig. 5 taken from the study of the Chinese.

From this phenomenon of "clustering," we infer that whatever factors are operating to affect the general susceptibility of our informants to illness do not exert a constant influence at all times. Their effect is greater at some times, and less at others. There is no predictable period of life when such clusters appear, and they have no consistent duration or magnitude. From this we infer that these factors probably arise out of some changing and unpredictable relationship between each individual and his environment.

By correlating events and situations in the life histories of our informants with the occurrence of clusters of illness, we have attempted to ascertain what consistent features of the individual's relationship to his envi-

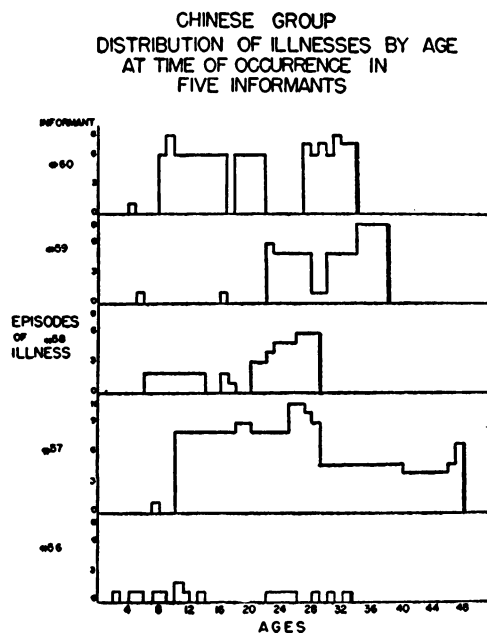


FIG. 5

ronment might be associated with fluctuations in his general health. So far as we have been able to determine, physical hardship, geographic and climatic change, and changing exposures to toxic or infectious agents, are not the significant variables. Only occasionally does it appear that the development of an isolated illness, or a cluster of illnesses, is simply the result of some fortuitous encounter with bacteria, trauma, or other influences arising from the physical environment. Genetic inheritance and constitutional endowment undoubtedly play a role in general susceptibility to illness, and probably have an important influence upon the total sickness experienced by an individual throughout his life. But the data in general suggest that, as compared to the effects of the life situation, these factors are relatively unimportant in determining the distribution of illness in any of the groups. In any case, it is difficult to invoke them as an explanation of the clustering of illness at special times in the lives of individual informants.

We find that clusters of illness usually are associated with periods when an individual is attempting to adapt to a difficult life situation (Figs. 6 and 7). That is to say, such clusters commonly occur during periods of demonstrable conflict with parents, siblings,

or spouse, threat to social position, loss of significant supports, or excessive demands created by the sickness or aggressive behavior of other members of the family, employers, associates, and so on. Such observable difficulties in the relationship to the social environment are usually directly stated by the informants to be difficult or unpleasant, with a detailed description of why they are difficult and with appropriate feelings. From such data alone it is possible to say that, in each of these informant groups, the relationship of the informants to their social environment has an important influence upon the occurrence of clusters of illness, and that it is much more consistently related to this than any other factors which have been considered. But the correlation between clusters of illness and such "objective" evidences of difficult life situations is by no means complete. There are a great many instances of informants existing in what are objectively "difficult life situations," with no observable evidence of illness; and, conversely, there are many other instances in which clusters of illness appeared in the lives of informants at times when they were existing in what objectively appear to be benign life situations.

It is axiomatic that man does not react to his environment as it is "objectively" perceived by other people; rather he reacts to it, as he, himself, perceives it in terms of his own needs and aspirations (using "perceive" to include both conscious and unconscious processes). There is no way to ascertain how a man perceives his life situation without using his own subjective impressions, or the inferences of an observer, or both. Information obtained in this manner is always biased by the attitudes of the informant, and is very likely to be biased by those of the observer. Such information, therefore, does not lend itself to being counted or quantified in a mathematical fashion. On the other hand, the observer can validly state his inferences and present the original case material upon which these inferences are based. It has been the general inference of all of the observers who have participated in these studies that the great majority of the clusters of illness which have occurred in the lives of our informants have occurred during life situations which the informant, himself, perceived as stressful, even though this situation might

CHINESE STUDY

ILLNESSES EXPERIENCED BY ONE INFORMANT

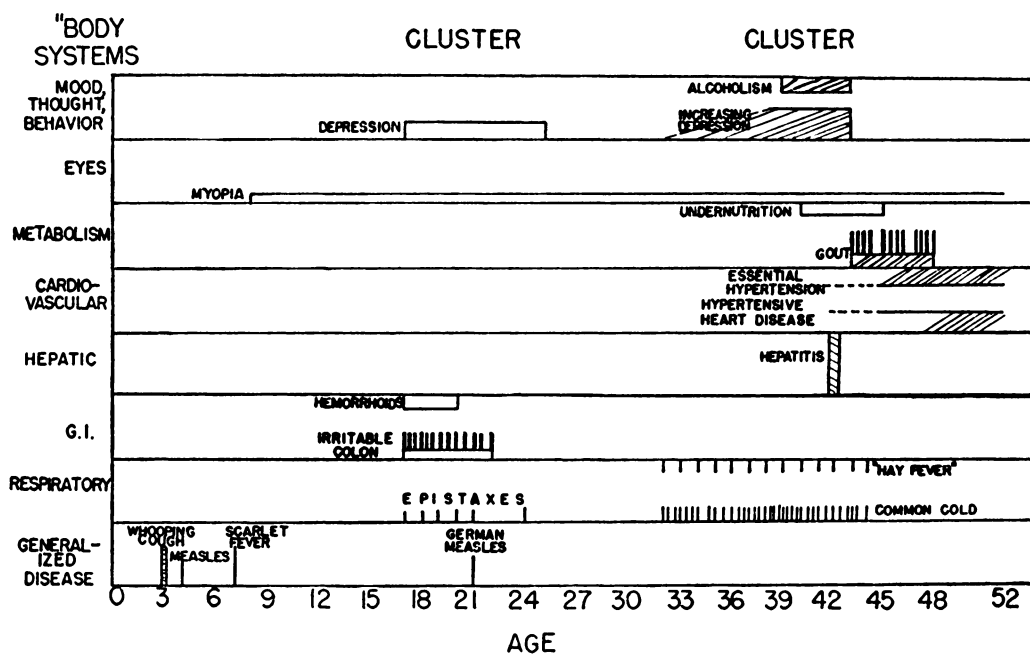


FIG. 6

CHINESE STUDY

RELATION BETWEEN LIFE SITUATIONS AND CLUSTERS OF ILLNESS IN ONE INFORMANT

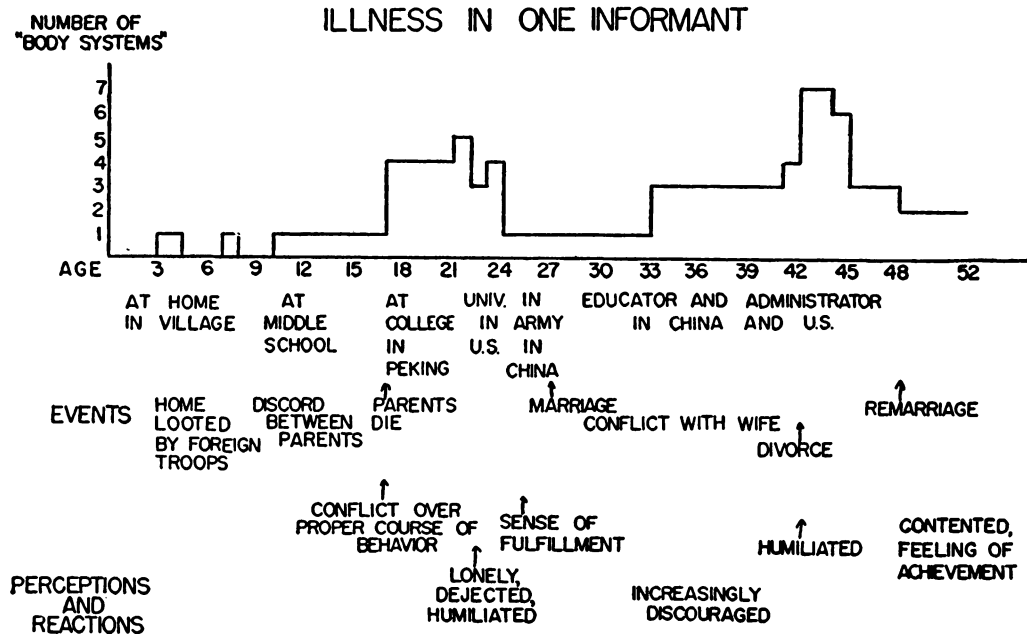


FIG. 7

appear benign to an "objective" observer; conversely, when "objectively" difficult life situations are not associated with illness the informants usually did not perceive these life situations as difficult, even though the observer might expect them to do so. This was a consistent observation among the informants in all of the groups, regardless of their general state of health.

CONCLUSION

Our inferences from our studies are these: man's relation to his social environment as

perceived by him has a profound effect upon his general health. It influences the development and progression of all forms of illness, regardless of their nature, and regardless of the influence of other etiological factors. Its effect often far outweighs the influence of changes in the physical environment and the effects of random exposure to pathogenic or noxious agents. As a group, those who are experiencing difficulty in adapting to their social environment have a disproportionate amount of all of the illness which occurs among the adult population.